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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/681,374	03/27/2001	Xiao-Dong Sun	RD-27727	3259

6147            7590            04/03/2003  
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EXAMINER	
MACCHIAROLO, PETER J	
ART UNIT	PAPER NUMBER

2875

DATE MAILED: 04/03/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

<b>Office Action Summary</b>	Application No.	Applicant(s)
	09/681,374	SUN ET AL. 
	Examiner Peter J Macchiarolo	Art Unit 2875
-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --		
<b>Period for Reply</b>		
A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.		
<ul style="list-style-type: none"> <li>- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.</li> <li>- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.</li> <li>- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.</li> <li>- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).</li> <li>- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).</li> </ul>		
<b>Status</b>		
1) <input checked="" type="checkbox"/> Responsive to communication(s) filed on <u>17 March 2003</u> .		
2a) <input type="checkbox"/> This action is <b>FINAL</b> .                    2b) <input checked="" type="checkbox"/> This action is non-final.		
3) <input type="checkbox"/> Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under <i>Ex parte Quayle</i> , 1935 C.D. 11, 453 O.G. 213.		
<b>Disposition of Claims</b>		
4) <input checked="" type="checkbox"/> Claim(s) <u>1-25 and 39-46</u> is/are pending in the application.		
4a) Of the above claim(s) _____ is/are withdrawn from consideration.		
5) <input type="checkbox"/> Claim(s) _____ is/are allowed.		
6) <input checked="" type="checkbox"/> Claim(s) <u>1-25 and 39-46</u> is/are rejected.		
7) <input type="checkbox"/> Claim(s) _____ is/are objected to.		
8) <input type="checkbox"/> Claim(s) _____ are subject to restriction and/or election requirement.		
<b>Application Papers</b>		
9) <input type="checkbox"/> The specification is objected to by the Examiner.		
10) <input checked="" type="checkbox"/> The drawing(s) filed on <u>27 March 2001</u> is/are: a) <input type="checkbox"/> accepted or b) <input checked="" type="checkbox"/> objected to by the Examiner. Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).		
11) <input type="checkbox"/> The proposed drawing correction filed on _____ is: a) <input type="checkbox"/> approved b) <input type="checkbox"/> disapproved by the Examiner. If approved, corrected drawings are required in reply to this Office action.		
12) <input type="checkbox"/> The oath or declaration is objected to by the Examiner.		
<b>Priority under 35 U.S.C. §§ 119 and 120</b>		
13) <input type="checkbox"/> Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f). a) <input type="checkbox"/> All b) <input type="checkbox"/> Some * c) <input type="checkbox"/> None of: 1. <input type="checkbox"/> Certified copies of the priority documents have been received. 2. <input type="checkbox"/> Certified copies of the priority documents have been received in Application No. _____. 3. <input type="checkbox"/> Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)). * See the attached detailed Office action for a list of the certified copies not received.		
14) <input type="checkbox"/> Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application). a) <input type="checkbox"/> The translation of the foreign language provisional application has been received.		
15) <input type="checkbox"/> Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.		
<b>Attachment(s)</b>		
1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)		
2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)		
3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____		
4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s) _____		
5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)		
6) <input type="checkbox"/> Other: _____		

## **DETAILED ACTION**

### *After Final Practice*

1. The finality of the previous Office action is hereby withdrawn pursuant to 37 CFR 1.129(a). The After Final amendment has been entered and considered.

### *Response to Amendment*

2. The reply filed on March 17, 2003 consists of changes to the Abstract, and remarks related to the prior rejection of claims in the Final Rejection. However, claims 1-25, and 39-46 are not allowable as explained below.

### *Drawings*

3. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore:
4. (1) The composition for electron emitters of a gas discharge device as recited in claims 1-12 and 39-46, and
5. (2) The gas discharge device comprising the electrically conductive material as recited in claims 12-25 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.
6. The drawings are further objected to under 37 CFR 1.83(b) because they are incomplete.

37 CFR 1.83(b) reads as follows:

When the invention consists of an improvement on an old machine the drawing must when possible exhibit, in one or more views, the improved portion itself, disconnected from the old structure, and also in another view, so much only of the old structure as will suffice to show the connection of the invention therewith.

Accordingly, a new figure(s) labeled "Prior Art" must be included showing a gas discharge device which the current invention improves.

7. Applicant is required to submit a proposed drawing correction in reply to this Office action. However, formal correction of the noted defect may be deferred until after the Examiner has considered the proposed drawing correction. Failure to timely submit the proposed drawing correction will result in the abandonment of the application.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

9. Claims 1-2, 5-13, 16-22, 41-42, and 45-46 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiyama (JP Pub. 57-096,453, "Sugiyama").

10. In regards to claims 1-2, 7-13, and 18-22, Sugiyama discloses a gas discharge device comprising a mixture of carbon fibers (4) and alkaline-earth metal oxides (2) being dispersed in an electrically conductive material (1) to promote electron emission. Sugiyama further teaches, for example in the abstract, that this configuration lengthens the lifetime and improves the efficiency of the filament (1) during thermionic emission.

11. Sugiyama is silent to the composition containing carbon nanotubes.

12. However, carbon nanotubes are becoming recognized as an attractive alternate to carbon fibers as electron emitters, since carbon nanotubes have better electron emitting properties than carbon fibers.

13. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the electrode of Sugiyama, to have a coating on the filament including carbon nanotubes in order to further increase the filament's efficiency.

14. The Examiner notes that the claim limitation "...wherein said carbon nanotubes are produced by a catalytic cracking and pyrolyzing of hydrocarbons" in claims 7 and 18, are drawn to a process of manufacturing which is incidental to the claimed apparatus. It is well established that a claimed apparatus cannot be distinguished over the prior art by a process limitation. Consequently, absent a showing of an unobvious difference between the claimed product and the prior art, the subject product-by-process claim limitation is not afforded patentable weight (see MPEP 2113). Further, the intermediate steps of the process, recited in claims 8-11, 19-22, are likewise not afforded patentable weight.

15. In regards to claims 5-6, 16-17, 41-42, and 45-46, Sugiyama teaches all of the recited limitations of claims 2 and 13 (above).
16. Sugiyama is silent to the amount of carbon nanotubes that are needed in the composition to produce a workable electron stream for the gas discharge device.
17. However, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.
18. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the gas discharge device of Sugiyama, with a proportion of carbon nanotubes in the composition being in a range from 30% to 90%, since it has been held that discovering the optimum or workable ranges involves only routine skill in the art.
19. Claims 3-4, 14-15, 23-25, 39-40, and 43-44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sugiyama in view of Nakamoto (USPN 6,097,138; "Nakamoto").
20. In regards to claim 3-4, 14-15, 39-40, and 43-44, Sugiyama teaches all of the recited limitations of claim 1 (above).
21. Sugiyama is silent to the exact diameter of carbon nanotubes.
22. However, Nakamoto teaches in the abstract that carbon nanotubes having a diameter of about 30 nm or less are known, and this allows for optimal electron emission, thereby reducing the driving voltage and increasing efficiency.
23. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the discharge device of Sugiyama, wherein the diameter of

the carbon nanotubes are in a range from about 1 nm to about 100 nm, since Nakamoto teaches nanotubes having a diameter of about 30 nm are known to reduce the driving voltage and increase efficiency.

24. In regards to claims 23-25, Sugiyama teaches all of the recited limitations of claim 12 (above).

25. Sugiyama is silent to a gas discharge device further comprising a background gas contained within at a pressure of less than about 0.3 kPa, further comprising mercury vapor.

26. However, a gas discharge device comprising mercury vapor and a background gas (argon) at a pressure of less than about 0.3 kPa is well known in the art.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to construct the gas discharge device of Sugiyama, further comprising a background gas contained within at a pressure of less than about 0.3 kPa and mercury vapor, since it is well known in the art that this configuration allows a gas discharge device to operate properly.

### *Response to Arguments*

27. Applicant's arguments filed March 17, 2003 have been considered.

### *Conclusion*

28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

29. U.S. 2002/0121856, published September 5, 2002, to Tsai claims priority to provisional application 60/272,945 filed March 2, 2001. Tsai discloses a fluorescent lamp having carbon nanotubes disposed on the cathode, which is nearly identical to Applicant's invention. However, this prior art is not relied upon in this Office Action.

30. U.S. Patent 6,294,867 to Lynn supports the Examiner's statement that a gas discharge device comprising mercury vapor and a background gas at a pressure of less than about 0.3 kPa is known in the art.

31. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Peter J Macchiarolo whose telephone number is (703) 305-7198. The examiner can normally be reached on 7:30 - 4:30, M-F.

32. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sandra O'Shea can be reached on (703) 305-4939. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

33. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

pjm  
March 27, 2003



Sandra O'Shea  
Supervisory Patent Examiner  
Technology Center 2800